

**IN THE CLAIMS:**

- 1 1. (Original) A method for uniformly distributing data transmitted by a server over a plu-  
2 rality of underlying links of an aggregate within a computer network, the method com-  
3 prising the steps of:  
4       defining a unit of data as a datagram;  
5       apportioning each datagram into at least one fragment at the server;  
6       associating each fragment to an underlying link of the aggregate on the basis of an  
7 Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the  
8 aggregate; and  
9       transmitting the fragment over its associated underlying link from the server to the  
10 computer network.
- 1 2. (Original) The method of Claim 1 wherein the step of associating comprises the step of  
2 producing a result representing a remainder upon dividing the IP ID by the number of  
3 active links.
- 1 3. (Original) The method of Claim 2 wherein the step of associating further comprises the  
2 steps of:  
3       calculating the IP ID of each datagram in a sequential manner; and  
4       rotating the fragments of each datagram among all the underlying links to thereby  
5 ensure that all fragments having the same IP ID are provided to the same physical link of  
6 the aggregate.
- 1 4. (Original) The method of Claim 1 wherein the step of associating comprises the steps  
2 of:  
3       logically combining the IP ID with a predetermined mask to produce a quantity;

4           right shifting the quantity a predetermined number of places; and  
5           establishing a threshold at which a group of data is forwarded to each underlying  
6 link of the aggregate.

1   5. (Original) The method of Claim 4 wherein the step of associating further comprises the  
2 step of producing a result representing a remainder upon dividing the right shifted logi-  
3 cally combined quantity IP ID and predetermined mask by the number of active links.

1   6. (Original) The method of Claim 5 wherein the IP ID is a 16-bit value, the predeter-  
2 mined mask is 0xFF80 and predetermined number of right shifted places is 7, and  
3 wherein the group of data comprises 128 IP IDs.

1   7. (Original) The method of Claim 6 wherein the group of data comprises one of 128 dif-  
2 ferent transport control protocol (TCP) fragments and 128 different user datagram proto-  
3 col (UDP) datagrams.

1   8. (Original) The method of Claim 7 wherein each UDP datagram comprises up to 23  
2 fragments.

1   9. (Original) The method of Claim 1 further comprising the steps of:  
2           loading at least one data buffer of the server with the at least one fragment;  
3           fetching the fragment from the data buffer; and  
4           loading at least one queue of the server with the fragment, the queue associated  
5 with the underlying link.

1   10. (Original) A system adapted to uniformly distributing data over a plurality of underly-  
2 ing links of an aggregate within a computer network, the system comprising:  
3           a processor;

4 a memory coupled to the processor and having locations addressable by the proc-  
5 essor;

6 an operating system resident in the memory locations and executed by the proces-  
7 sor, the operating system configured to implement a modified load balancing technique  
8 that defines a unit of data as a datagram, the operating system comprising an Internet Pro-  
9 tocol (IP) layer that apportions the datagram into at least one fragment, the operating sys-  
10 tem further comprising a virtual interface process that associates the fragment to an un-  
11 derlying link of the aggregate on the basis of an IP identifier (ID) of the datagram and a  
12 number of active links of the aggregate; and

13 at least one network adapter coupled to the memory and processor that cooperates  
14 with a network driver of the operating system to transmit the fragment over the associated  
15 underlying link to the computer network.

1 11. (Original) Apparatus for uniformly distributing data transmitted by a server over a  
2 plurality of underlying links of an aggregate within a computer network, the apparatus  
3 comprising:

4 means for defining a unit of data as a datagram;

5 means for apportioning each datagram into at least one fragment at the server;

6 means for associating each fragment to an underlying link of the aggregate on the  
7 basis of an Internet protocol (IP) identifier (ID) of each datagram and a number of active  
8 links of the aggregate; and

9 means for transmitting the fragment over its associated underlying link from the  
10 server to the computer network.

1 12. (Original) The apparatus of Claim 11 wherein the means for associating comprises  
2 means for producing a result representing a remainder upon dividing the IP ID by the  
3 number of active links.

1 13. (Original) The apparatus of Claim 12 wherein the means for associating further com-  
2 prises:

3 means for calculating the IP ID of each datagram in a sequential manner; and  
4 means for rotating the fragments of each datagram among all the underlying links  
5 to thereby ensure that all fragments having the same IP ID are provided to the same  
6 physical link of the aggregate.

1 14. (Original) The apparatus of Claim 11 wherein the means for associating comprises:

2 means for logically combining the IP ID with a predetermined mask to produce a  
3 quantity;

4 means for right shifting the quantity a predetermined number of places; and

5 means for establishing a threshold at which a group of data is forwarded to each  
6 underlying link of the aggregate.

1 15. (Original) The apparatus of Claim 14 wherein the means for associating further com-  
2 prises means for producing a result representing a remainder upon dividing the right  
3 shifted logically combined quantity IP ID and predetermined mask by the number of ac-  
4 tive links.

1 16. (Original) A computer readable medium containing executable program instructions  
2 for uniformly distributing data transmitted by a server over a plurality of underlying links  
3 of an aggregate within a computer network, the executable program instructions compris-  
4 ing program instructions for:

5 defining a unit of data as a datagram;

6 apportioning each datagram into at least one fragment at the server;

7 associating each fragment to an underlying link of the aggregate on the basis of an  
8 Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the  
9 aggregate; and

10           transmitting the fragment over its associated underlying link from the server to the  
11   computer network.

1   17. (Original) The computer readable medium of Claim 16 wherein the program instruc-  
2   tion for associating comprises a program instruction for producing a result representing a  
3   remainder upon dividing the IP ID by the number of active links.

1   18. (Original) The computer readable medium of Claim 17 wherein the program instruc-  
2   tion for associating further comprises program instructions for:  
3           calculating the IP ID of each datagram in a sequential manner; and  
4           rotating the fragments of each datagram among all the underlying links to thereby  
5   ensure that all fragments having the same IP ID are provided to the same physical link of  
6   the aggregate.

1   19. (Original) The computer readable medium of Claim 16 wherein the program instruc-  
2   tion for associating comprises program instructions for:  
3           logically combining the IP ID with a predetermined mask to produce a quantity;  
4           right shifting the quantity a predetermined number of places; and  
5           establishing a threshold at which a group of data is forwarded to each underlying  
6   link of the aggregate.

1   20. (Original) The computer readable medium of Claim 19 wherein the program instruc-  
2   tion for associating further comprises the program instruction for producing a result rep-  
3   resenting a remainder upon dividing the right shifted logically combined quantity IP ID  
4   and predetermined mask by the number of active links.